Static Imager Model Calibration

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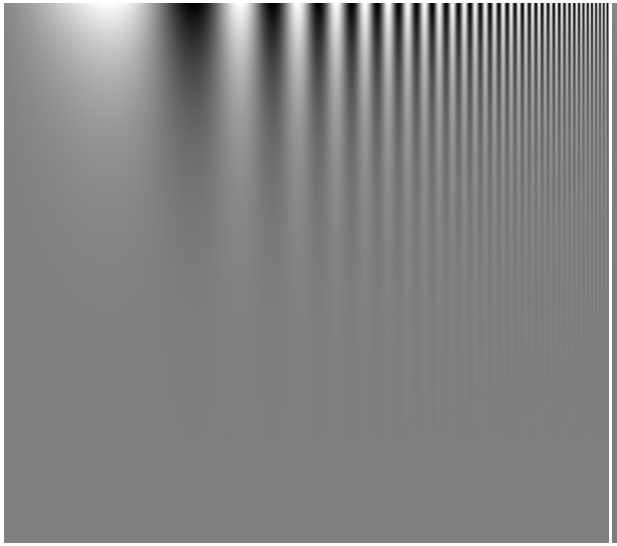
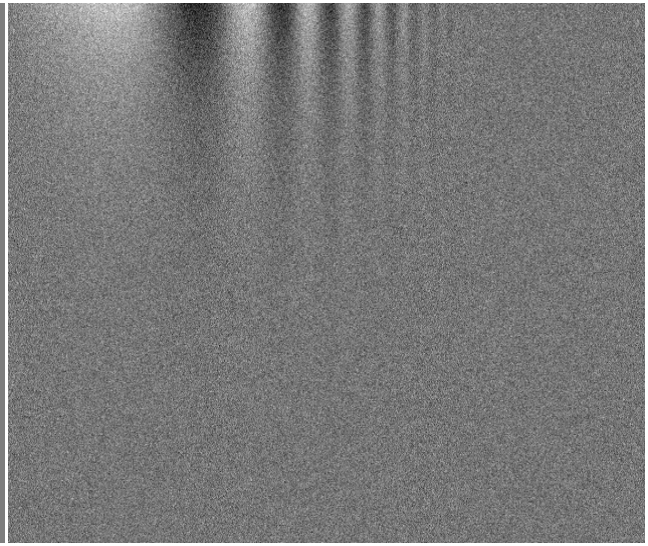
Sensor Performance

Eye



Eye + Blur

Eye + Blur + Noise



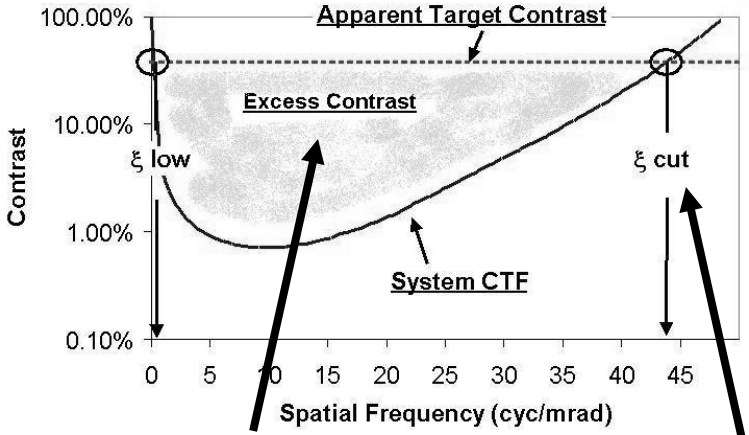
Probability of Task Performance versus Range

Source Contrast: C_{src}

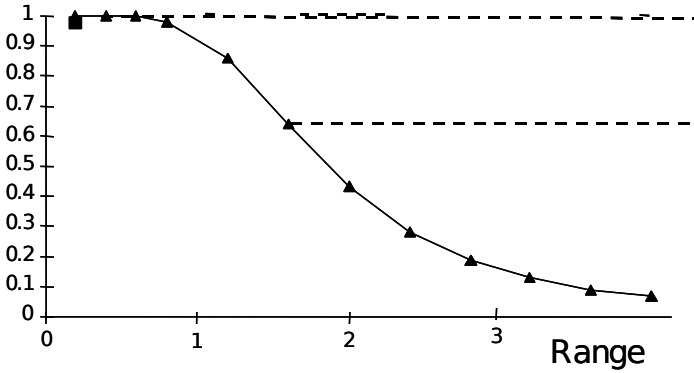
Char. Dim. $s = \sqrt{Area_{tgt}}$

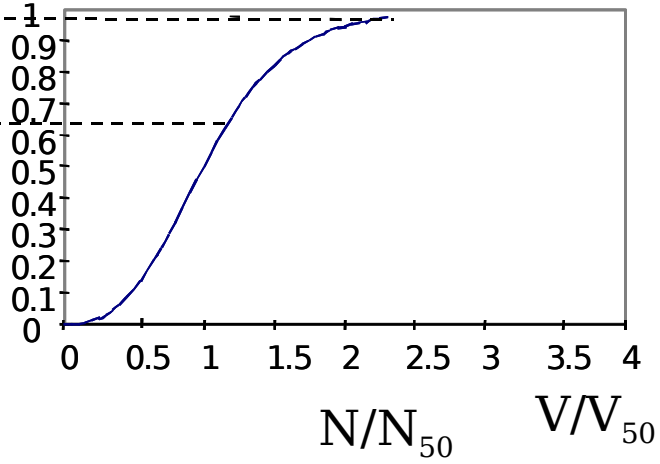
Atmospheric Transmission

Range to Sensor (R)



$$V = \int_{\xi low}^{\xi cut} \sqrt{\frac{C(\xi)}{CTF(\xi)}}\, d\xi \left[\frac{s}{R}\right] \quad \textbf{or} \quad N = \xi_{cut}\left[\frac{s}{R}\right]$$

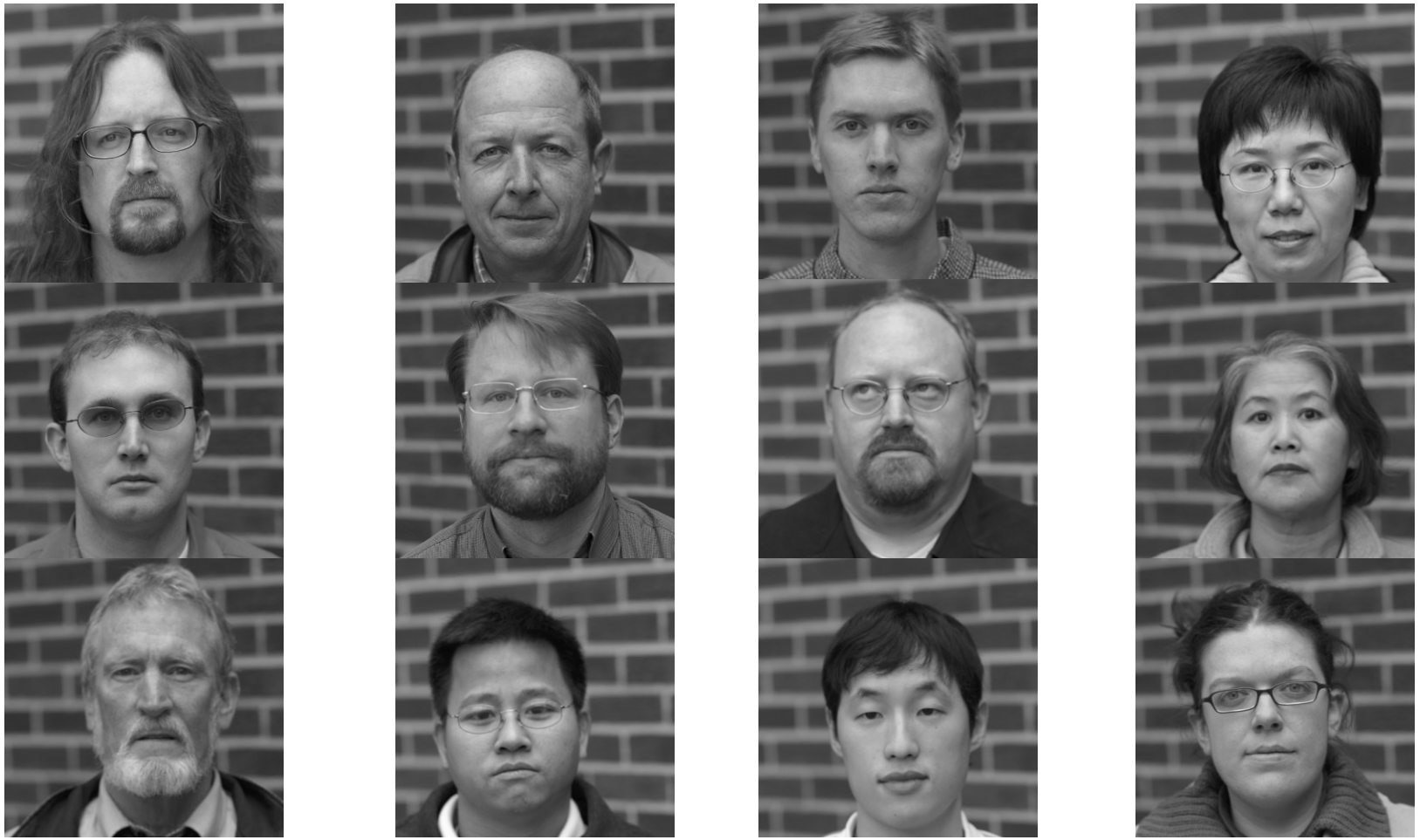




Experimental Approach

- Define target set and collect imagery
- Perform target set calculations to characterize target dimension and contrast
- Prepare images for testing
- Perform perception experiment
  - N-alternative forced choice perception experiment done with human observers
  - All participants trained to a 95% identification level on pristine imagery prior to the experiment

Target Set

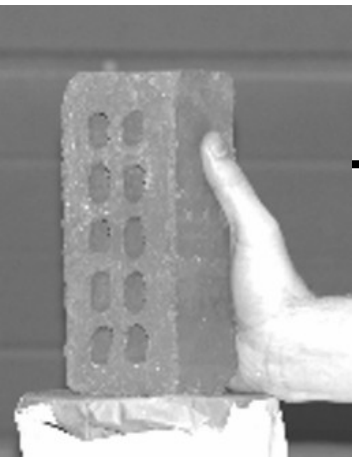


Target Characterization

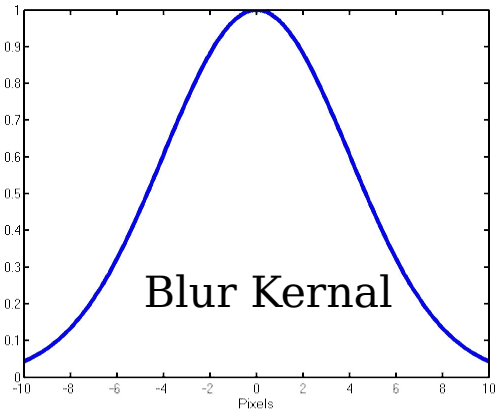
- Perform target set calculations for:
  - target dimension
  - contrast

Image Pre-processing to Limit Number of Resolvable Cycles

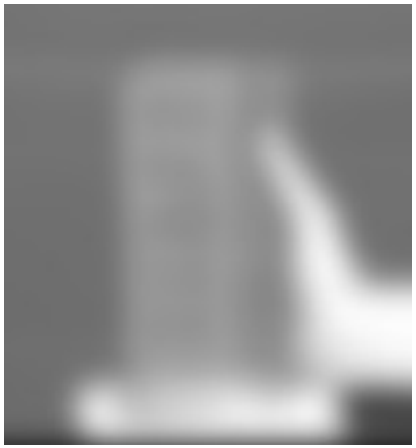
Pristine Image



2-D Convolution



Test Image

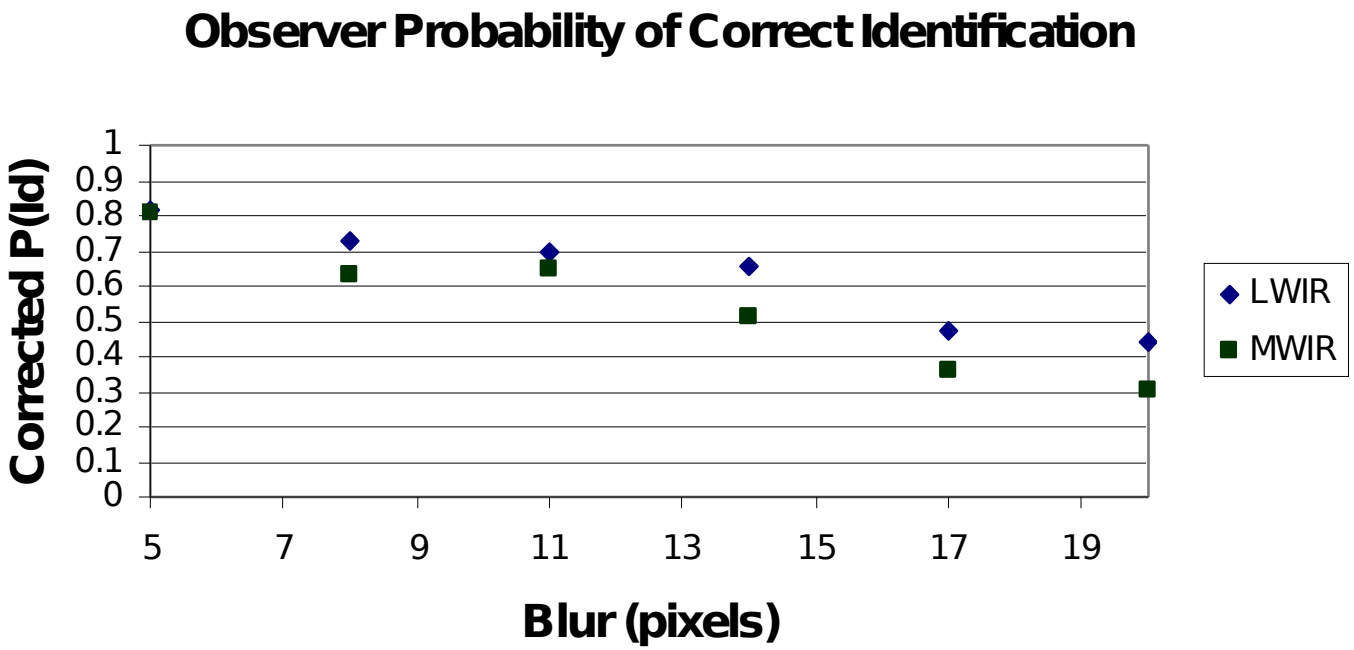


- Images blurred with varying width Gaussian kernals

$$Y = e^{\pi\left(x/_{blur}\right)^2}$$

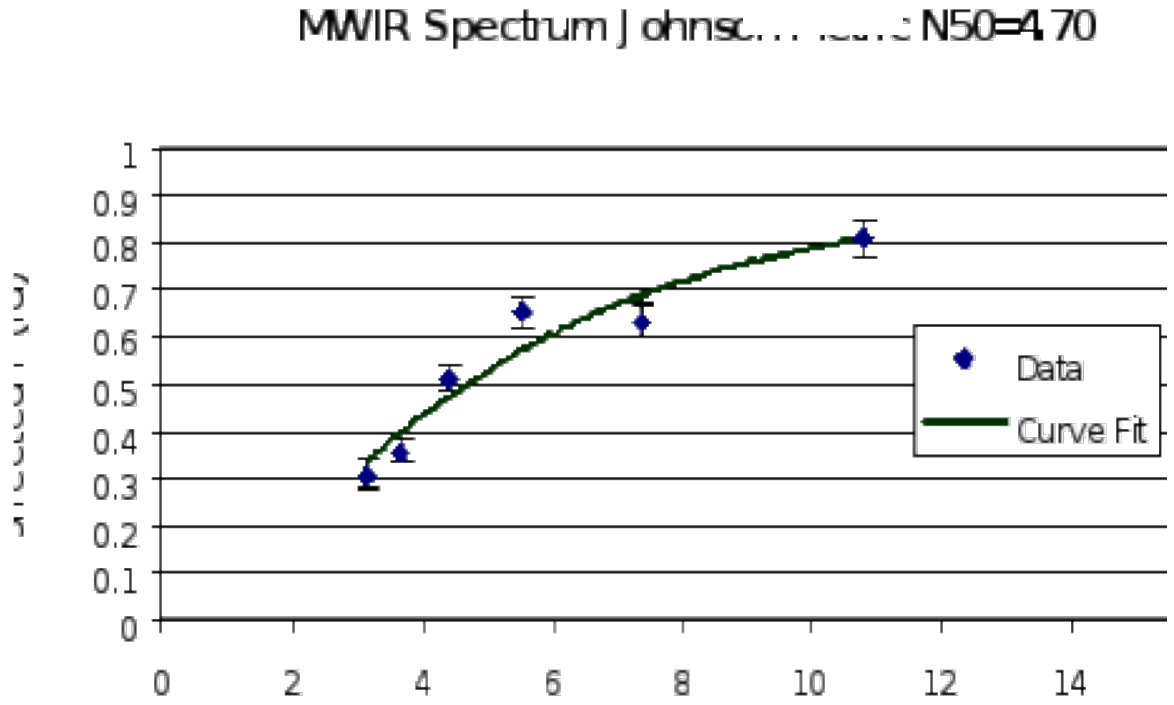
Cell	A	B	C	D	E	F
Blur	5	8	11	14	17	20

Experimental Results



- Conduct human perception experiments to correlate the number of resolvable cycles to the probability of identification

Resolvable Cycle Calculations



- Calculate the number of resolvable cycles required to perform this task